

L. H.
NEMAT.

**HETEROTYLENCHUS AUTUMNALIS SP. N. (NEMATODA:
SPHAERULARIIDAE), A PARASITE OF THE FACE FLY,
MUSCA AUTUMNALIS DE GEER**

P. A. A. LOOF
Burg. Prinslaan 22
EDE

W. R. Nickle

Reprinted from THE JOURNAL OF PARASITOLOGY
Vol. 53, No. 2, April 1967, p. 398-401
Made in United States of America

HETEROTYLENCHUS AUTUMNALIS SP. N. (NEMATODA: SPHAERULARIIDAE), A PARASITE OF THE FACE FLY, MUSCA AUTUMNALIS DE GEER

W. R. Nickle

Research Nematologist, Crops Research Division, Agricultural Research Service,
U. S. Department of Agriculture, Beltsville, Maryland

ABSTRACT: *Heterotylenchus autumnalis* sp. n., a nematode parasite of the introduced face fly, *Musca autumnalis* De Geer, of horses and cattle, found in New York, New Jersey, Missouri, and Nebraska, is described and illustrated. It causes sterility of the insect female.

In 1966 Stoffolano and Nickle reported that a parasitic nematode of the genus *Heterotylenchus* caused sterility in the female face fly, *Musca autumnalis* De Geer. Percentage of infection from field populations of both male and female face flies ranged from 8 to 44 and averaged about 23. Though this parasite was first found in New York State, I have subsequently identified it from New Jersey, Missouri, and Nebraska as well. This nematode destroys the ovaries of the female fly and its role in reducing field populations is being studied by other workers.

Though this fly was introduced into the USA from Europe, the nematode parasite has not been found in Europe. Therefore, it is significant that a native parasitic nematode of another closely related host-insect may have successfully adapted to parasitism of *Musca autumnalis*.

Heterotylenchus, a heteromorphic genus, has an alternation of gamogenetic and parthenogenetic generations. There are five known species of this genus: parasites of onion flies in Denmark (Bovien, 1937); plague-carrying fleas in Russia (Kurochkin, 1960); and three species of ground beetles in Germany (Wachek, 1955). No heterotylenchs have been hitherto described from North America.

BIOLOGY AND LIFE HISTORY

Dissection of a parasitized adult face fly reveals thousands of nematodes of three sizes in the body cavity, ovaries, and thorax of the insect where one or more adult parasitic females, 12 to 24 parthenogenetic females, and thousands of nematode eggs and larvae can be found. Closer examination of the insect's

ovaries reveals packets of males and unmated females that have developed at sites normally occupied by eggs. During mock oviposition, the nematodes are deposited in manure. Then the nematodes mate; the male dies; and the impregnated young female enters the body cavity of the fly maggot, apparently through the body wall. Once inside the maggot, the small female nematode develops into the adult parasitic stage which lays eggs in the hemolymph. These eggs develop into parthenogenetic females, which lay large numbers of eggs which in turn develop into the small males and females. When they develop to a length of about 1 mm, they penetrate the insect ovaries, completing the life cycle.

Heterotylenchus autumnalis sp. n.

(Figs. 1-6)

Material studied

Ten ♀♀ : L = 0.980 mm (0.820 to 1.050 mm). W = 24.6 μ (21 to 29 μ). a = 40.2 (32.0 to 50.0). c = 6.8 (6.6 to 7.1). V = 76.8% (74.1 to 79.3%). Stylet = 21 μ .

Holotype ♀ : L = 0.885 mm. W = 27.6 μ . a = 32.0. c = 6.8. V = 76%. Stylet = 21 μ .

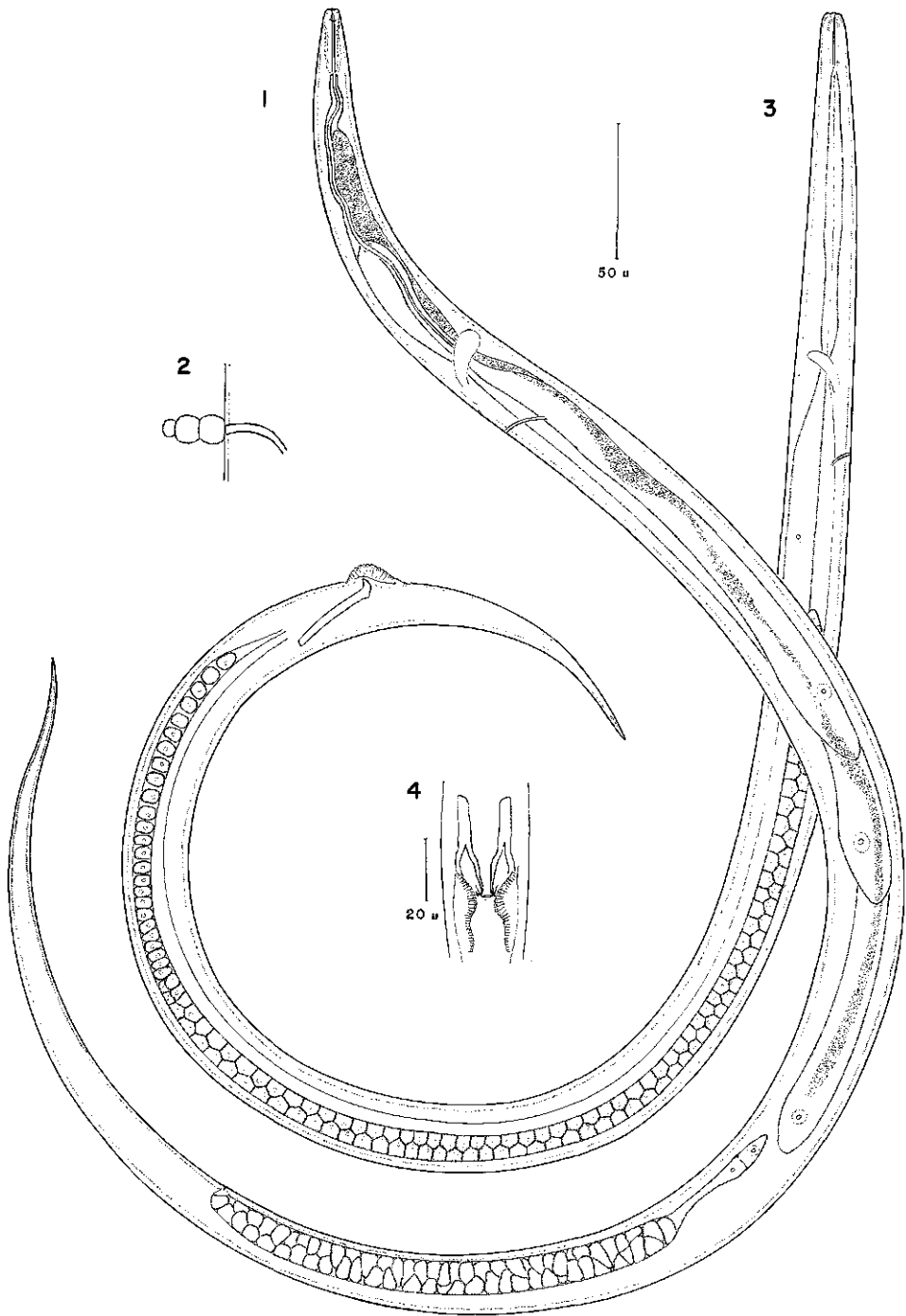
Ten ♂♂ : L = 0.823 mm (0.749 to 0.900 mm). W = 22.4 μ (19.5 to 30.0 μ). a = 37.1 (25.8 to 41.5). c = 7.7 (7.0 to 8.4). Spicule = 33.6 μ (30.2 to 35.7 μ). Stylet = 18.9 μ (18.8 to 19.0 μ). T = 57% (55 to 59%).

Allotype ♂ : L = 0.845 mm. W = 24.4 μ . a = 34.6. c = 7.5. Spicule = 33.6 μ . Stylet = 18.9 μ . T = 57%.

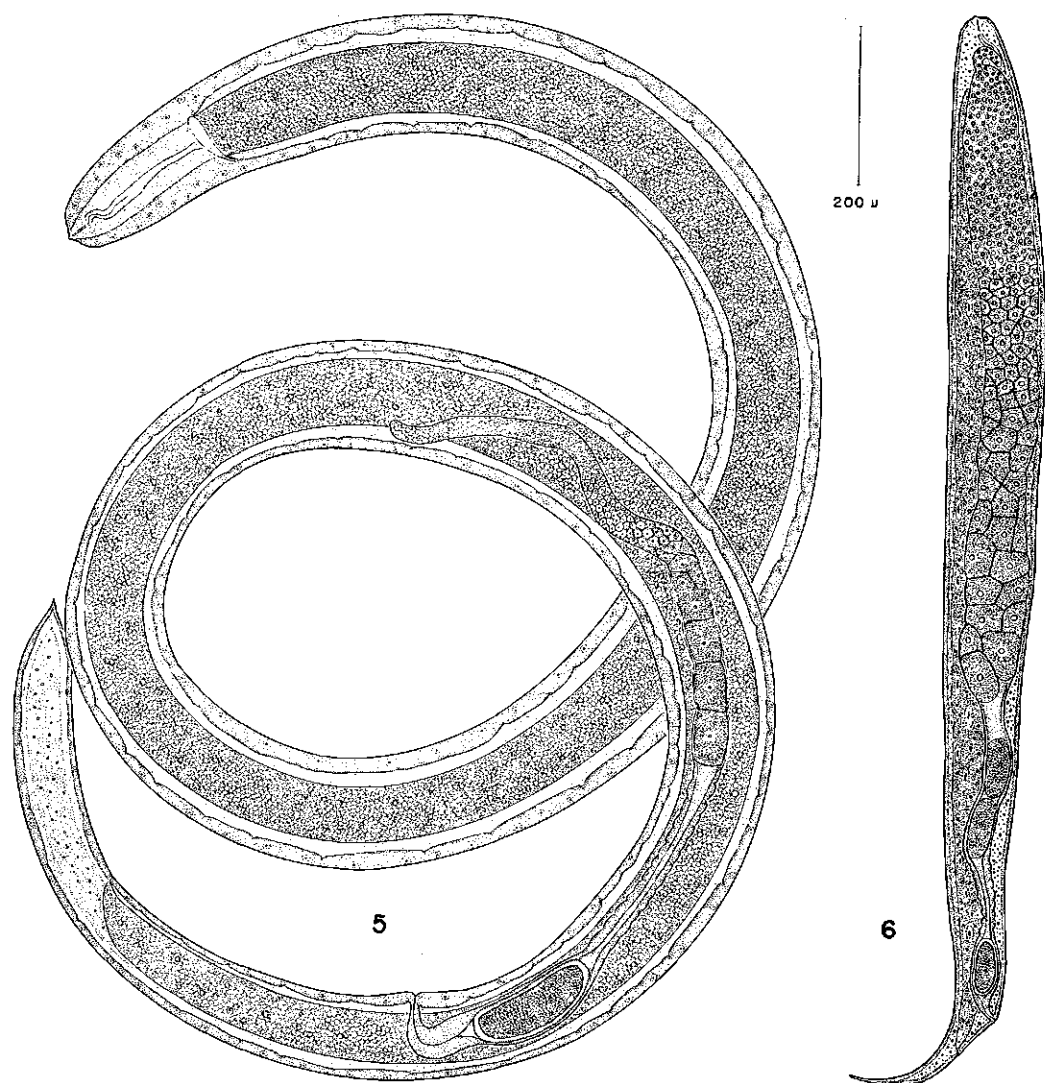
Ten Adult Parasitic ♀♀ : L = 5.18 mm (2.82 to 7.65 mm). W = 0.168 mm (0.129 to 0.215 mm). a = 30.9 (19.0 to 45.2). c = 13.5 (9.5 to 17.4). V = 82.4% (78.5 to 83.8%). Stylet = 21 μ .

Ten Parthenogenetic ♀♀ : L = 1.438 mm (1.178 to 1.672 mm). W = 0.120 mm (0.100 to 0.148 mm). a = 12.0 (9.7 to 13.9). c = 12.8 (11.0 to 14.6). V = 91.5% (86.6 to 93.0%). Stylet = 16.0 μ (14.7 to 16.8 μ).

Received for publication 16 December 1966.



FIGURES 1-4. *Heterotylenchus autumnalis* sp. n. from *Musca autumnalis* in New York State. 1. Female, lateral view. 2. Membrane-like evagination from excretory pore. 3. Male, lateral view. 4. Spicules and caudal alae, ventral view.



FIGURES 5-6. *Heterotylenchus autumnalis* from *Musca autumnalis* in New York State. 5. Adult parasitic female, lateral view. 6. Parthenogenetic female, lateral view.

Description

Heterosexual female (Fig. 1): Found in ovaries of fly and in manure. Body of fixed specimens almost straight, or bow-shaped. Stylet well developed, with dorsally oblique aperture, without knobs. Hemizonid just anterior to excretory pore. Excretory pore posterior to nerve ring; duct heavily sclerotized. Three specimens found with membrane-like evagination from excretory pore (Fig. 2). Dorsal esophageal gland orifice located almost a spear length behind the base of the stylet. Esophagus with prominent, overlapping glands which extend to mid-body. Median bulb absent. Anterior part of esophagus nonmuscular. Granu-

lar secretions from the dorsal esophageal gland accumulate in a large ampulla near the dorsal gland orifice and posteriad. Subventral gland orifices also easily seen, with swollen ampullae. Secretions from the subventral glands not granular but copious. Esophageal gland nuclei prominent. Intestine degenerate. Anus barely visible. Gonad typically sphaerulariid, consisting of a two-celled ovary, short, slim oviduct, and a large tubular uterus packed with unusually large, single-celled sperm. Vulval lips do not protrude. Phasmids not seen. Tail tapers gradually to a rounded point.

Heterosexual male (Fig. 3): Found in ovary of insect and in manure. Body tends to assume a bow-like shape with a strong dorsal bend pos-

teriad from the anus when killed by gentle heat. Stylet similar to but not as well developed as in the female. Hemizonid not seen. Excretory duct heavily sclerotized as in female. Nerve ring anterior to excretory pore. Dorsal esophageal gland orifice located almost a spear length behind base of stylet. Esophagus weakly developed. Median bulb absent. Anterior part of esophagus non-muscular; esophageal glands not easily seen but overlap intestine, not as well developed as in female; esophageal secretions not prominent. Intestine not degenerate. Gonad single, well developed, not flexed. Sperm larger than most sphaerulariids, single-celled. Spicules (Fig. 4) large, with long shaft and wide scoop-like tip. Gubernaculum absent. Caudal alae adanal. Phasmids not seen. Tail tip tapers gradually to a rounded point.

Adult parasitic female (Fig. 5): Found in body cavity of fly. Body tends to form a double coil when killed by gentle heat. Cuticle thin and smooth. Somatic musculature with prominent nuclei. Lip region slightly offset. Stylet as in free-living female, without knobs. Excretory duct degenerate. Nerve ring appears degenerate, though visible. Esophagus degenerate, gland orifices as in free-living female. Intestine large, granular in appearance, fills most of body cavity, and probably contains reserve food. Anus not prominent. Oviparous. Gonad not as well developed as in other sphaerulariids. Produces about 24 eggs. Ovary extends less than half the body length. Spermatheca not seen. Tail tip with characteristic spike.

Parthenogenetic female (Fig. 6): Found in body cavity of the fly. Body assumes a cigar-shape when killed by gentle heat, with a dorsal bend posteriad to the vulva. Cuticle thin and smooth. Stylet present, without knobs. Excretory duct easily seen. Nerve ring and esophagus degenerate. Intestinal cells with large nuclei. Anus not prominent. Oviparous. Gonad well developed, often extending into stylet region. Produces hundreds of eggs. Anterior part of ovary may not be completely expanded. Oocytes arranged about rachis. Vulval lips protruding. Tail tapers to a rounded point.

Differential diagnosis

H. autumnalis is similar to *H. aberrans* but

it differs from this species in the size and shape of the spicule, lack of knobs on stylet, presence of a spike-like tail tip in the adult parasitic stage, larger sperm, and presence of adanal caudal alae. The parthenogenetic females of *H. stammeri*, *H. boviens*, and *H. pawlowskyi* are ovoviviparous, whereas *H. autumnalis* is oviparous. *H. wuelkeri* has a sausage-shaped adult parasitic female, and its spicule is only half the size of that of *H. autumnalis*.

Type host: *Musca autumnalis* De Geer.

Type locality: New York State, USA.

Distribution: This species was collected in 14 counties in New York State and has been found in New Jersey, Missouri, and Nebraska.

Holotype: Female found by W. R. Nickle, 1 October 1965, from body cavity of face fly, in Ithaca, New York. Slide No. T-85t, USDA Nematode Collection, Beltsville, Maryland.

Allotype: Male collected by J. G. Stoffolano, Jr., 26 August 1965, from body cavity of face fly, in Ithaca, New York. Slide No. T-86t, USDA Nematode Collection, Beltsville, Maryland.

Paratypes: Several males, females, adult parasitic females, and parthenogenetic females deposited in USDA Nematode Collection, Beltsville, Maryland, and University of California Nematode Survey Collection, Davis, California.

LITERATURE CITED

- BOVIEN, P. 1937. Some types of association between nematodes and insects. Vid. Meddel. fra Dansk naturh. Forening, København. **101**: 1-114.
- KUROCHKIN, Y. V. 1960. The nematode *Heterotylenchus pawlowskyi* n. sp. castrating flea carriers of plague. (In Russian.) Dokl. Acad. Nauk USSR **135**: 1281-1284.
- STOFFOLANO, J. G., JR., AND W. R. NICKLE. 1966. Nematode parasite (*Heterotylenchus* sp.) of face fly in New York State. J. Econ. Entomol. **59**: 221-222.
- WACHEK, F. 1955. Die entoparasitischen Tylenchiden. Parasitol. Schriftenreihe, H.3, VEB G. Fischer Verlag, Jena. 119 p.